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PROBLEMS IN SURVEYS OF DISPERSED AND MOBILE POPULATIONS: THE CASE OF THE YUKON RESIDENTS OUTDOOR RECREATION SURVEY

by

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I

A central concern in all social surveys is to obtain a survey population which is as closely representative as possible of the larger population which is the subject of the study. In seeking this, the researcher sets out, first, to choose an accurate sample of the subject population and, second, to ensure the highest possible rate of response from this sample. The choosing of an accurate sample is affected, in particular, by the accuracy of the sampling frame from which it is chosen and by the relative ease of access to the members of the sample. The rate of response is affected by such factors as the suitability of persons to participate in the survey, the ability of the field staff to make contact with them, and the subjects' willingness to cooperate in the survey. Two factors which are of increasing concern in choosing an accurate sample and achieving a high rate of response are population dispersion and mobility.

The purpose of this paper is threefold: first, to outline some specific problems that occur in conducting surveys of dispersed and mobile populations; second, to illustrate the nature and magnitude of such problems by reference to a particular case, the *Yukon Residents Outdoor Recreation Survey*, carried out in 1977; and third, to suggest ways in which these problems may be resolved, or at least alleviated.

The term *dispersed population* is taken to mean a population which is distributed relatively thinly over a wide geographical area. The Yukon Territory in the northwest part of Canada had a population, in 1976, of approximately 20,000 people spread over an area of about 207,000 square miles, or 535,925 hectares. The Territory is bordered on the north by the Arctic Ocean, on the south by the Province

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of British Columbia, on the east by The Northwest Territories, and on the west by the U.S. State of Alaska. The average population density in 1976 was one person per 10 square miles (26 hectares). However, about two-thirds of the total population lived in the capital city of Whitehorse, while between one and two per cent did not live within a settlement at all. The remainder of the population lived in 16 permanent settlements ranging in population size from about 40 persons to about 1,500 persons (Table 1). In fact, settlement in the Territory displayed a fourfold pattern. First, there was the capital city, Whitehorse, which served as the administrative, communications and service centre and which, as noted, contained about two-thirds of the total population in 1976. Second, there were the major resource towns, based mainly upon mining, each of which had a population of approximately 1,000 to 1,500 in 1976: Faro, Mayo and Elsa. Third, there are the local and regional service centres, located on the major highways throughout the Territory, which ranged in size from less than 100 population to about 800 population in 1976: such communities as Dawson, Watson Lake, Beaver Creek and Ross River. Finally, there was the community of Old Crow, with a 1977 population of approximately 170 persons, located 75 miles inside the Arctic Circle, and with no land communictions to other settlements within the Territory (Figure 1).

In sum, the population of The Yukon Territory at the time of the outdoor recreation survey in 1976 was a dispersed population in the sense that it was clustered into 17 settlements which, with the exception of Whitehorse, were relatively small and which, for the most part, were a hundred or more miles (160 kilometres) apart with little or nothing between them.

The term *mobile population* has two meanings. It refers, first, to *residential mobility*: that is, the tendency of people to move their place of permanent residence. Residential mobility has always been relatively high in the Yukon Territory, with estimates of the proportion of the population arriving in and leaving the Territory in any single year during the 1970s ranging from about 10 per cent (the Territorial

Table 1
Population of the Yukon Territory, By Community and Region

Region/Community	Population (As at June 1, 1976) Region	Community
OLD CROW	170	
Old Crow		170
DAWSON-CLINTON	1,687	
Dawson City		887
Clinton Creek		800
MAYO-ELSA	1,153	
Mayo		470
Elsa		683
FARO-ROSS RIVER	1,667	
Faro		1,471
Ross River		196
PELLY-CARMACKS	371	
Pelly Crossing		97
Carmacks		274
BEAVER CREEK	126	
Beaver Creek		126
BURWASH-DESTRUCTION	108	
Burwash Landing		42
Destruction Bay		66
HAINS JUNCTION	330	
Haines Junction		330
TESLIN-CARCROSS	552	
Teslin		315
Carcross		237
WATSON LAKE	1,073	
Watson Lake		1,073
WHITEHORSE	14,606	
Whitehorse		14,606
TOTAL	21,843	21,843

Source: Derived from Yukon Health Care Insurance Plan Master List, as at June 1, 1976.

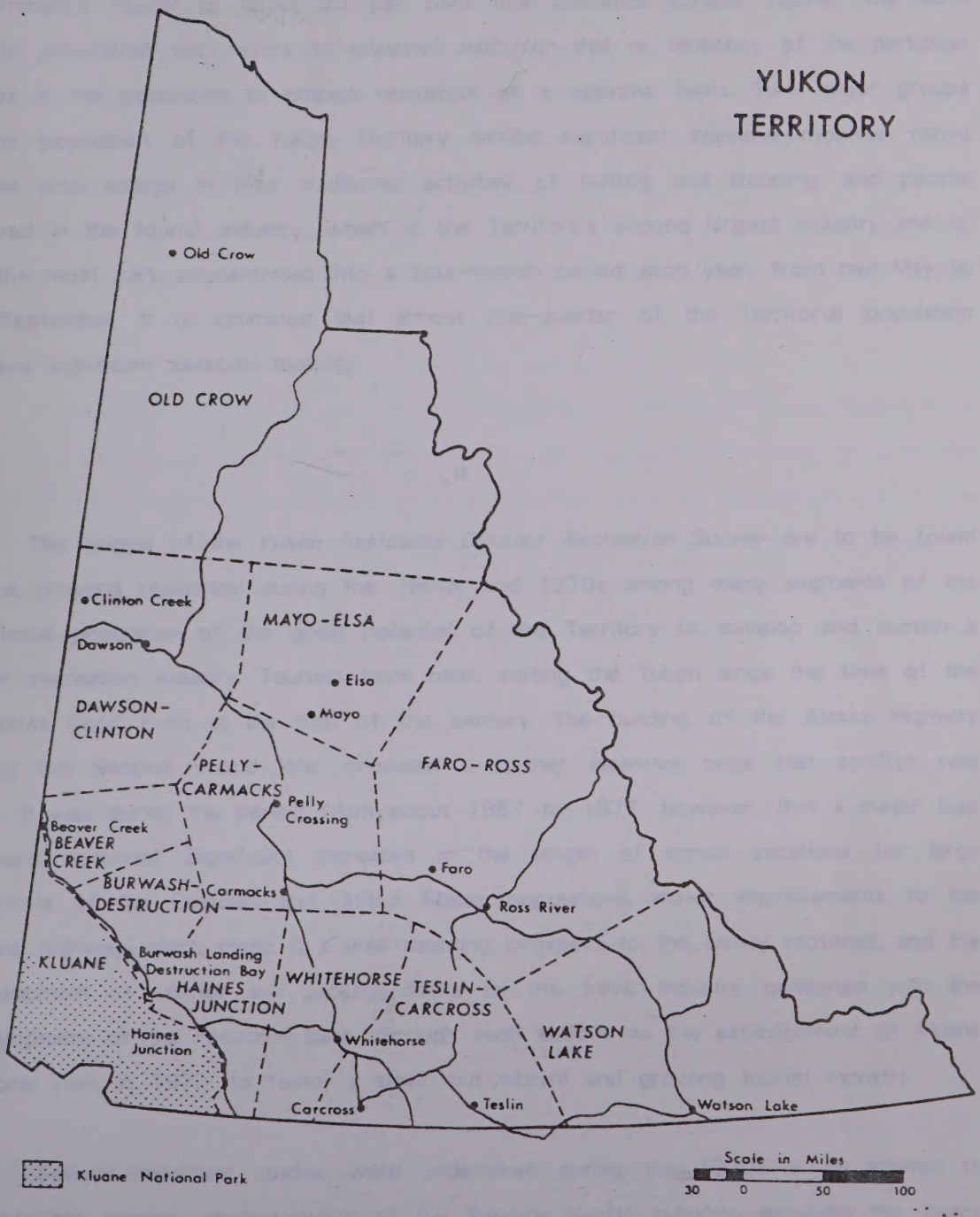
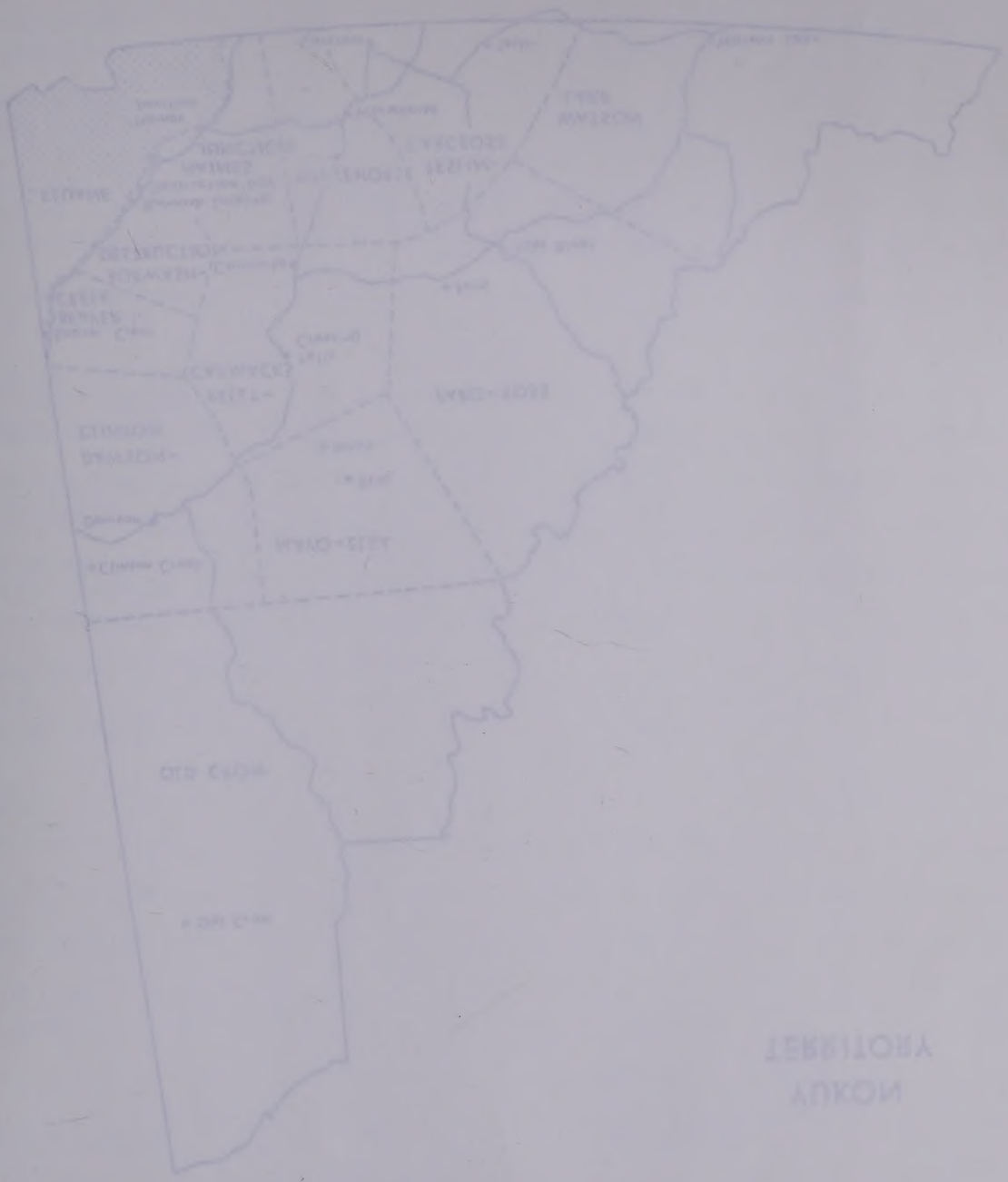


Figure 1. The Yukon Territory and its Regions



Government's figure) to about 20 per cent (the Statistics Canada figure). The term *mobile population* also refers to *seasonal mobility*: that is, tendency of the particular groups in the population to change residence on a seasonal basis. Two major groups in the population of the Yukon Territory exhibit significant seasonal mobility: native people who engage in their traditional activities of hunting and trapping; and people involved in the tourist industry, which is the Territory's second largest industry and is, for the most part, concentrated into a four-month period each year, from mid-May to mid-September. It is estimated that almost one-quarter of the Territorial population displays significant seasonal mobility.

II

The origins of the *Yukon Residents Outdoor Recreation Survey* are to be found in the growing realization during the 1960s and 1970s among many segments of the Territorial population of the great potential of the Territory to develop and sustain a major recreation industry. Tourists have been visiting the Yukon since the time of the *Klondike Gold Rush* at the turn of the century. The building of the Alaska Highway during the Second World War provided a further incentive once that conflict was over. It was during the period from about 1967 to 1977, however, that a major leap forward occurred. Significant increases in the length of annual vacations for large segments of the Canadian and United States populations, major improvements to the Alaska Highway which made it a less daunting prospect to the family motorist, and the development of charter and package tours by the travel industry combined with the development of the resource base, through such actions as the establishment of Kluane National Park in 1972, to foster a small, but vibrant and growing tourist industry.

Several important studies were undertaken during the 1970s in at attempt to identify the primary characteristics of the Yukon's tourist industry, including the *Yukon Exit Survey* in 1975 and the *Dawson City Tourist Exist Survey* in 1976. These studies, however, neglected one very important component of the recreation sector of

Yukon society: the recreation activities of the Yukoners themselves. By the end of 1976, a sound preliminary base of data about visitors to the Territory was established. Infromation was available about their numbers, characteristics, major activities and expenditures. But virtually nothing was known about the recreation activities of Yukon residents themselves, except in the case of those visiting Dawson City in 1976. It was with the intent of complementing the volume of tourist infromation with data about Yukon residents that the *Yukon Residents Outdoor Recreation Survey* was carried out in 1976.

The *Survey* was carried out under the direction of the author, who reported to a Steering Committee made up of representatives of the two sponsoring agencies: the Yukon Territorial Government and Parks Canada. The Steering Committee played an active supervisory role in the study, meeting six times over the 9-month period of the study, to review and advise upon major aspects of the research (such as the research design, the pretest survey instruments, the final survey instruments, and the fieldwork arrangements).

The main purpose of the *Survey* was to provide data on outdoor recreation activity patterns of persons living in the Yukon Territory, which could serve as base data for the development of master plans for outdoor recreation areas and facilities in the Territory and for Kluane National Park. This infromation would not be employed alone, but would be added to information obtained through other sources, including the tourism studies discussed in the previous section and Parks Canada's public participation program for the planning of Kluane National Park.

Initially, the general objective was to discover the recreation use patterns by residents of the Yukon Territory of facilities, waters and lands in, adjoining and surrounding Territorial campgrounds, lakes and rivers, and Kluane National Park. Subsequent to the preparation of a *Report* for the study and a meeting of the Steering Committee to consider this, the general objective was amended slightly. The

Territory was divided into twelve regions, or districts, as shown in Figure 1. The objective was to determine the outdoor recreation activity patterns of the residents of the eleven regions with definable populations (Kluane National Park was not considered to have a resident population) and to relate these, to the extent possible, to regional locations. In short, all regions except Kluane National Park were to be considered as origins and all were to be considered as destinations. The intent was not to tie activities to precise sites (lakes, rivers and campgrounds), but to regions.

The general objective was expressed through four specific objectives, as follows: first, to measure summer time resident outdoor recreation activity patterns; second, to measure winter time resident outdoor recreation activity patterns; third, to ascertain the annual vacation patterns of Territorial residents during the previous two years; and fourth, to relate summer time and winter time activity patterns and annual vacation patterns to major profile characteristics of the survey population, including the ownership of selected items of outdoor recreation equipment.

As distinct from the limitations, which are those constraints of a study which are beyond the control of the researcher, delimitations are those constraints intentionally set by the researcher and/or the sponsor. The first of these for the *Yukon Residents Outdoor Recreation Survey* was its concern with residents of the Territory only. Visitors were to be excluded, having been considered in the previous studies noted earlier. A second delimitation had to do with the range of activities to be encompassed: outdoor recreation activities that ordinarily take place in Territorial campgrounds, rivers, lakes and parks, and Kluane National Park. Outdoor recreation activities that usually make use of urban facilities, such as football and baseball, and indoor activities, such as basketball and dancing, were to be excluded from consideration. Also significant was the time constraint. Activity patterns were to be examined only for a period of one year preceding the date of the *Survey* (two years in the case of vacation patterns). Other constraints were imposed at later stages of the study, but these were, essentially, a function of methodological limitations rather

than constraints imposed by the researcher and/or sponsors on substantive grounds.

Mention should also be made of some key definitions. Since the survey was to be restricted to residents of the Yukon Territory only, it was important to develop a working definition of the term *resident*. For purposes of the survey, a resident was defined as an individual whose primary residence had been in the Yukon Territory for a period of at least three months prior to June 1, 1976. It was also determined that the study would encompass only residents aged 16 years and over as of this date, the minimum legal age for possession of a driver's licence in the Territory. It was also important to develop a working definition of the term *outdoor recreation activities*. Following consultations among the research team and the Steering Committee, a list of 17 activities was developed. This consisted of four activities that were considered to be exclusively winter time activities and thirteen that were thought to take place predominantly during the summer time, though some may have been undertaken on a year-round basis (Table 2).

Financial constraints dictated that the preferred survey method, the structured interview, could not be employed. This was especially so because of the insistence, on the part of the sponsors, that the survey population cover all eleven populated regions of the Territory, which would have necessitated sending interviewers, at great expense, into relatively remote parts of the Territory. It was proposed, therefore, to conduct the survey by means of a self-completed questionnaire to be delivered to a random sample of residents of each of the eleven populated regions of the Territory. Mindful, however, of the usually very low response rates obtained for mailed self-completed questionnaires, it was proposed that the questionnaires be personally delivered to and collected from the sample subjects by local residents. Though this would increase the costs of the fieldwork, it would still be considerably cheaper than an interview survey, since relatively unskilled field staff could be employed and less time would be required per subject.

Table 2
Outdoor Recreation Activities Encompassed By The Survey

A. *Winter Time Activities*

1. Cross Country Skiing
2. Snowmobiling
3. Snow Shoeing
4. Dog Sledding

B. *Summer Time (or Year-Round) Activities*

1. Tent Camping
2. Trailer/Pick-up/Motorhome Camping
3. Hiking/Backpacking
4. Mountain Climbing
5. Hunting
6. Fishing/Ice Fishing
7. Motor Boating/Water Skiing
8. Swimming/Scuba Diving
9. Canoeing/Kayaking/Rowing
10. Nature Study/Sightseeing/Photography
11. Driving for Pleasure/Picnicking
12. Trail Biking
13. Visiting Historic Parks/Sites

III

In seeking an accurate sample for a dispersed population such as that found in the Yukon Territory, there are two matters of concern: first, how to establish the size of the population of sampling units; and second, how to obtain or develop a satisfactory sampling frame.

In principle, there is no difficulty in defining the nature of a population of sampling units. In the case of the *Yukon Residents Outdoor Recreation Survey*, this was to consist, as has already been noted, of all persons, aged 16 years and over, whose primary residence had been in the Territory for a period of at least three months prior to June 1, 1976. But, while it is not difficult to define the nature of a population of sampling units, major problems arise in establishing its size. Where populations are dispersed and mobile, it is often difficult to determine total size. Even the numbers obtained at a Decennial Census are likely to be inaccurate because of difficulties in enumerating the members of nomadic gorups and Native Bands, as well as other itinerants. Furthermore, with a highly mobile population, the accuracy and, hence, the utility of Census figures deteriorates rapidly over a short period of time.

This problem was well illustrated in the case of the Yukon survey. Two sources existed giving the size of the Territorial population. Statistics Canada estimates, based upon 1971 Census figures and assumptions about fertility, mortalitiy and mobility rates, suggested that the population at June 1, 1976, was approximately 20,000 persons. The Territorial Government's figures, based upon *Medicare* registrations, gave a total of 21,843 persons. The difference was of the order of 10 per cent, which is a significant proportion given the relatively low absolute figures involved. From the beginning, therefore, the *Survey* was faced with a major discrepancy between the two official population totals for the Territory.

Turning to the issue of obtaining or developing a satisfactory sampling frame, it is useful to begin by noting that such frames can suffer from one or more of five deficiencies. A frame can be *inaccurate*, as when, for example, there is wrong infromation about the units, including the listing of units that do not exist. A frame can be *incomplete*, as when some units are missing entirely. It can be *subject to duplication* if some units are included more than once. A frame may be *inadequate* if it does not cover all the categories of data that are necessary for the survey to be mounted. Finally, a frame may be *out-of-date* if its composition is likely to have altered significantly between the time of its compilation and the time of its use. Frames that encompass dispersed and mobile populations tend to reflect all of these deficiencies more than frames for other populations.

The frame that was employed for the *Yukon Residents Outdoor Recreation Survey* was the *Yukon Health Care Insurance Plan (or Medicare) Master List* which provides an Alphabetical Listing of all Insured Persons, by Individual Communities with infromation about the insured person's name; mailing address; birthdate; employer; and Plan Subscription and Membership numbers. This was, prima facie, the only complete list of all persons in the Territory. It was claimed that because of the legal requirement that a person resident three months or more in the Territory must register with the Plan, the *Master List* would serve two functions: first, it would give an accurate absolute size for the population of sampling units (when the names of persons of less than 16 years of age were removed); and second, it would be less susceptible to the five sampling frame deficiencies than any other potential frame considered (such as motor vehicle registration lists,, electoral lists, and telephone directories).

The sample for the *Yukon Residents Outdoor Recreation Survey* consisted of 1,711 persons, 10 per cent of the 17,111 persons aged 16 years and over included on the Medicare *Master List*. (The remaining 4,732 persons in the total listed population of 21,843 were aged less than 16 years). The sample was drawn from the

Master List by a systematic sampling process, the *List* having been arranged by household and individuals within communities. Variable sampling fractions were used for each of the eleven regions so as to provide adequate absolute numbers for statistical analysis of the regional data independently. Thus, while the overall sampling fraction was 1-in-10 persons, it ranged from 1-in-2 persons in the Beaver Creek and Burwash Destruction region to 1-in-13 for the Whitehorse region (Table 3). This, of course, required the later weighting of the data for the analysis of infromation for the entire Territory, so as not to give over-representation to the populations of the small regions.

In summary, it was decided to accept the Territorial Government's figure for the total population of the Territory, simply because it was able to provide a listing of that population in the from of the Medicare *Master List*. It was not known, however, how accurate were both the total population figure and the individual names listed. The population of sampling units was derived by removing the names of persons aged less than 16 years from the *Master List*. The actual sample was then abstracted from the *Master List* by a systematic sampling process, with variable sampling proportions for each of the eleven regions and an overall proportion of 1-in-10 persons. Having done this, the *Survey* was then faced with contacting the persons in the sample, at which point further effects of population dispersion and the major effects of population mobility became evident.

IV

There are two aspects to the problem of contacting members of a sample for a dispersed and mobile population. First, one has to trace the members of the sample; then, one has to make contact with them. The first of these problems can, often, be the more difficult, since there are rarely street addresses in small and isolated settlements. At best, addresses consist of rural routes or box numbers, which do not

Table 3
The Survey Sample

Region	*Total Population* (1)	*Sample Size*	*Sampling Fraction* (2)
Old Crow	141	59	2:5
Dawson-Clinton	1,422	142	1:10
Mayo-Elsa	953	95	1:10
Faro-Ross River	1,364	136	1:10
Pelly-Carmacks	324	77	1:4
Beaver Creek	93	49	1:2
Burwash-Destruction	94	43	1:2
Haines Junction	248	72	3:10
Teslin-Carcross	447	82	1:5
Watson Lake	805	92	1:9
Whitehorse	11,220	864	1:13
Yukon Territory (Total)	17,111	1,711	1:10

1. Territorial and Regional Populations Aged 16 years and Over, As Listed by the *Yukon Health Care Insurance Plan* at June 1, 1976. The figures are different from those in Table 1 because persons under 16 years of age are not included.
2. Sampling Fraction is rounded to the nearest whole number.

permit field staff to identify the precise residence of any particular person in the sample. As well, for many native and ethnic groups, the same name will frequently arise: thus, there might be a half dozen or more persons with the same name. But even if these problems are overcome and one is able to identify the correct person in the sample and his or her place of residence, one then faces the problems of population mobility. An excessively high rate of residential mobility means that even with a relatively up-to-date sampling frame, many of the persons in the sample will no longer reside in the community. An excessively high rate of seasonal mobility means that, while, officially, the sample person may reside in the community, it is frequently difficult, if not impossible, to actually contact him or her.

These problems were very evident in the case of the *Yukon Residents Outdoor Recreation Survey*. Only 2 of the 17 settlements in the Territory (Whitehorse and Dawson) had street addresses. The remaining 15 settlements had only box numbers for the addresses of residents. Thus, a special procedure had to be developed for field staff to make contact with 705 members, or 41.2 per cent of the total sample! The problem was further compounded by the existence of different persons in the sample with the same name. Of 49 persons in the sample for Beaver Creek, 16 had the same family name, and four of these had the same given name! Similar situations existed for the samples in the Burwash-Destruction region and the Teslin-Carcross region.

The effects of residential and seasonal mobility can be detected through the infromation presented in Table 4. Contact was made with 662 persons, or 38.7 per cent, of the total of 1,711 persons in the sample. No contact at all was made with 560 persons, or 32.7 per cent. Contact was made with a *different* person at 489 residences, representing 23.6 per cent of the persons in the sample. This latter figure is a *minimum* measure of residential mobility, since the *Survey* assertained that the persons in the sample, recorded in the Medicare *Master List* as living at those residences, were, in fact, no longer living there. If the 560 persons with whom no

contact at all was made had also moved permanently, then the *maximum* measure of residential mobility was 1,049, or 61.3 per cent. If, on the other hand, these 560 persons were merely seasonally mobile, then the *maximum* measure of seasonal mobility was 560, or 32.7 per cent.

In summary, the *Survey* was faced with a situation in which there were no house and street addresses for 705 persons, or 41.2 per cent of the sample; where there were numerous cases of persons in the sample from the same communities who had identical names; where residential mobility over the 10-month period from the compilation of the sampling frame to its use was at least 23.6 per cent and possibly as high as 61.3 per cent; and where seasonal mobility could have been as high as 32.7 per cent.

V

The problems that have been identified in this discussion were dealt with in a variety of ways, none of which were wholly successful or satisfactory. An accurate and reliable figure for the total population of sampling units was never obtained. The figure based upon the Medicare *Master List* was employed simply because it appeared to be the most comprehensive listing of Territorial residents that was available. The *Master List* was, in fact, the only sampling frame that claimed to include *all* residents of the Territory, and not just those owning vehicles (Vehicle Registration List) or possessing a Driver's Licence (Motor Licence Registration List) or renting telephones (Telephone Book), and so on. It was evident, however, that the Medicare *Master List* was inaccurate - and not solely because it had been compiled 10 months prior to its use for the *Survey*. Several persons were included in the sample, who, according to reports from neighbors and others in the local communities, had left the Territory several years earlier. A fieldworker was told in one community that a person on the *List* had left the Territory 18 years earlier, while another was infromed that a person

Table 4

Contacts, Non-Contacts and Refusals

	Total	
	Numbers	Per Cent
TOTAL (Original Sample)	1,711	100.0
CONTACTS (Original Sample)	662	38.7
Refusal	195	11.4
Completions	467	27.3
NON-CONTACTS (Original Sample)	1,049	61.3
CONTACTS (Not Original Sample)	489	23.6
Substitute Refusal	145	8.5
Substitute Completion	344	20.0
NON-CONTACT (Absolute)	560	32.7
REFUSALS (Absolute)	340	19.9
COMPLETIONS (Absolute)	811	47.3
Original Sample	467	27.3
Substitute Sample	344	20.0
ALL CONTACTS	1,151	62.3
Original Sample	662	38.7
Substitutes	489	23.6

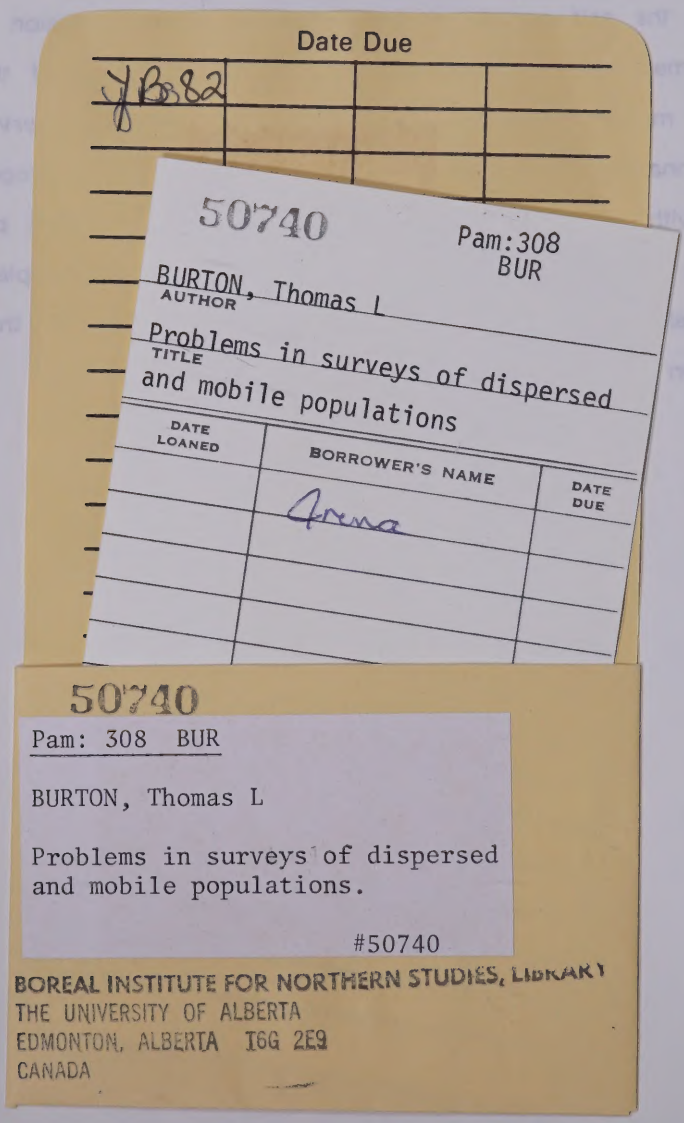
on the *List* had been dead for four years! (Presumably, somebody was still paying Medicare contributions in his name!). In fact,Medicare *Master List* suffered from all five ofthe deficiencies of sampling frames. It was *inaccurate* in that it listed persons who were no longer resident in the Territory. It was *incomplete* in that it did not list others who were resident in the Territory. It was *subject to duplication,* with several cases found of persons listed twice. It was *inadequate* in that it did not identify the residences of persons in 15 of the 17 settlements in the Territory. And it was *out-of-date,* in that many cases were found where the persons listed at particular residences (in the two settlements where house and street addresses were provided) had changed during the period since the *List* was compiled.

The problem of tracing members of the sample in the 15 communities where house and street addresses were not provided was solved by using local people to deliver and collect the *Survey* questionnaires. In many instances these fieldworkers knew most of the residents of the community on a personal basis and were, therefore, able to locate the members of the sample without difficulty. Where they did not know individuals on the sample list, they simply contacted a prominent local person who was likely to know them, such as the RCMP constable or the manager of the local cooperative store. The problem was handled differently in the two communities where field staff were provided with the names and addresses of sample persons. Here, they simply called at the given address. If the sample person was no longer living at the address, they were permitted to make a substitution, by asking the first adult to come to the door if he or she would complete the *Survey* questionnarie in place of the person originally listed as being at that address. By means of substitutions carried out in this manner, the original 467 completed questionnaires from 662 contacts were supplemented by a further 344 completions from 489 substitute contacts. The overall completion rate was thereby raised from 27.3 per cent to 47.3 per cent (Table 4).

Table 5
The Sample and the Response

Region	Total Adult Population	Sample Size Sought	Actual Sample Obtained	Sample Response Rate	Actual Sample As A Proportion of Total Population
	(n)	(n)	(n)	(%)	(%)
Old Crow	141	59	39	66.1	27.7
Dawson-Clinton	1,422	142	57	40.1	4.0
Mayo-Elsa	953	95	37	39.0	3.9
Faro-Ross River	1,364	136	66	48.5	4.8
Pelly-Carmacks	324	77	47	61.1	14.5
Beaver Creek	93	49	18	36.8	19.4
Burwash-Destruction	94	43	24	55.8	25.5
Haines Junction	248	72	42	58.3	16.9
Teslin-Carcross	447	82	37	45.1	8.3
Watson Lake	805	92	62	67.4	7.7
Whitehorse	11,220	864	382	44.2	3.4
Yukon Territory (Total)	17,111	1,711	811	47.3	4.7

The *Yukon Residents Outdoor Recreation Survey* was faced with a variety of problems caused by the fact that the population of the Territory is both dispersed and highly mobile. The *Survey* was unable to overcome all of the effects of this population dispersion and mobility. By such devices as the use of local residents to deliver and collect the self-completed questionnaires and the inclusion of substitutes at the addresses of members of the sample who had moved, many of the worst effects of dispersion and mobility were alleviated. In the final tally, the *Survey* obtained 811 completed questionnaires, respresenting 47.3 per cent of the proposed sample of 1,711 residents, with the regional response rate ranging from 36.8 per cent to 67.4 per cent (Table 5). This is a good rate of return for a self-completed questionnaire survey in any usual situation. It must be counted as excellent for the conditions that prevail in the Yukon Territory.



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